were in a good state of preservation; the pieces exhibiting the best marked effect of the copper were the strongest. The articles of which these pieces once formed a part had long since gone to decay; not coming in contact with the copper they were not spared to become articles of curiosity or of study to the ethnologist.—E. PALMER.

MICROSCOPY.

ROSS' NEW MICROSCOPES.—The adoption by this great house of the Jackson model of stand (which has long been very generally preferred in this country if not everywhere), in place of the transverse bar model which had come to be familiarly known as the Ross style, is an innovation of sufficient importance to attract special notice, and, we may add, congratulation. The magnificent workmanship of the old Ross stand is no secret and is a sufficient assurance of the mechanical excellence of the new ones, while the fact that they are designed by Mr. Wenham leaves nothing to be said as to their microscopical efficiency. The new stands, while adhering substantially to the Jackson model, combine some of the best features of the previous stands of Ross, Powell & Lealand, Ladd, and other makers.

The Ross' new patent object-glasses (devised by Mr. Wenham) are believed by the makers to have so well proved their superiority that they are now exclusively offered, and the old construction abandoned, from the $\frac{1}{2}$ inch upwards.

VERY THIN COVERING GLASS.—Mr. G. J. Burch, of the Queckett Club, recommends the following procedure for producing very thin covers, not for general use, but only when excessive thinness is required. Seal up the end of a $\frac{1}{4}$ inch glass tube in a blowpipe flame, and continue to heat it until so soft as to require turning to prevent its falling out of shape; then remove it from the flame and blow into it strongly until it swells, at first slowly and then suddenly, into a very thin bubble of glass, of perhaps four inches diameter. When cold it is to be broken in pieces, and the pieces cut to shape with a writing diamond. When perfect flatness is required, lay a piece on a flat strip of platinum foil and place it for a moment in a Bunsen flame, which, at a red heat, will both flatten and anneal it. A piece of this glass measured $\frac{1}{2500}$ inch $=$·0004 inch, while Dr. Pigott's measurement of the thinnest glass in his possession was ·0022, which is $5\frac{1}{2}$ times as thick.

FALSE-LIGHT EXCLUDER FOR OBJECTIVES.—Mr. Wenham's experiments upon the aperture of objectives, cutting off stray light by a perforated stop surrounding the focal plane of the objective, have suggested to Mr. Ingpen the usefulness of a similar contrivance for cutting off false light in objectives in actual use, and thereby preventing that milkiness of field which mars some otherwise excellent objectives. He slips over the objective a cap having a perforation a little larger than the field of the objective. When this cap is slipped down to the cover-glass, the full aperture of the lens is used and stray light excluded. The cap, by slipping it up toward or to the objective, may be made useful to secure a variety of reduced apertures. Such a contrivance which has hitherto been used in connection with micro-spectroscopic work is evidently capable of a more extended usefulness.

STAINING VEGETABLE TISSUES.—Persons unaccustomed to microscopical manipulation suffer much loss of time in working from such superb books as those of Beale and Frey, partly in selecting from the great wealth of material and partly from the necessary omission of minute details in the way of working directions. Of staining solutions, for instance, the beginner is at a loss to choose from the pages of excellent formulas, and is not unlikely to begin with the least suitable one; and, partly for this reason, few beginners are aware of the ease with which the modern methods of staining may be employed, or of the exquisite results attainable. Such will be glad to use the following hints, which are mainly abstracted from a paper by Dr. Christopher Johnston in the "Monthly Microscopical Journal."

For staining animal tissue carmine succeeds perfectly, and logwood gives also beautiful results, but aniline is unsatisfactory; while for vegetable work logwood-violet and aniline-blue are preferred to carmine, being easier to work and pleasanter to study, especially by lamplight.

Logwood staining was introduced by Boehmer, who used solutions of hæmatoxylin and alum, mixing them in small quantities when needed for use. Dr. Frey simplified the plan by mixing logwood and alum solutions until a violet color was produced, filtering the solution thus prepared, and keeping it for use when required. Dr. Arnold's plan, which is the most convenient, is to pulverize one part of extract of logwood and three parts of alum in a mortar,

and gradually add water so as to form a saturated solution, some of the powder being left undissolved. When filtered this should be of a dark violet color; if a dirty red, add more alum. After standing a few days add one-fourth of its bulk of 75 per cent. alcohol. Should a scum form on the surface, add a few drops of alcohol and filter.

Ordinary aniline blue is insoluble in water, but made soluble by the addition of sulphuric acid; but it may now be obtained in soluble form at the color shops, and a one per cent. aqueous solutifin of the soluble blue, with the addition of a little alcohol and a trace of oxalic or acetic acid may be used, or the solution sold as "Bower's Blue Ink," may be slightly acidulated and used instead.

The specimen, whether a section or a thin leaf, if it has not been blanched by previous maceration in alcohol, is decolorized by soaking in Labarraque's solution of chlorinated soda until perfectly achromatic and transparent, and then soaked in distilled water for an hour or two. It is next soaked in a three per cent. aqueous solution of alum, then in the logwood solution (diluted with twenty-five per cent. alcohol if a slight or slow effect is desired); when sufficiently stained it is washed in the alum solution, and then transferred through alcohol and oil of cloves, to damar varnish or a chloroformic solution of balsam. Or else the bleached and washed specimen is soaked in a three per cent. solution of oxalic acid in fifty per cent. alcohol, then in the blue fluid until intensely colored, washed in ninety per cent. alcohol to remove the superfluous aniline, and transferred promptly through absolute alcohol and oil of cloves to damar or the balsam solution. A small weight is placed upon the cover, and a temporary label on the slide while the balsam hardens.

The logwood stainings may be mounted at leisure and at any time, but those of aniline must be completed at once or the color will wash out.

A Method of Preparing and Mounting Suitable Insects for Microscopical Examination.[1]—After procuring the insect, place it under a tumbler or suitable vessel with a few drops of ether; when dead, wet it with alcohol, and place it in liquor potassæ of the strength of 1 oz. (troy) fused caustic potassa and 1 pint distilled water.

[1] Read before the Memphis Microscopical Society, December 17, 1874.

Let it soak in this liquid until the skin or external part is soft, and the internal substance in such a condition that, upon slight pressure, the insect can be evacuated by the natural, or, if necessary, an artificial opening. This is best done under water, and a white plate is best to use.

When this is effected the object is to be cleaned. Have a camel's hair brush in each hand; with one hold the object, and with the other brush every part of the insect, and on both sides; float it on a glass slide, and dispose each part in a natural position, either creeping or flying.

Cover this slip with another glass slip of the same size, and press gently together, using only sufficient force to make it as thin as possible without crushing or destroying it.

Confine these two glasses, the insect being between, with a fine brass wire as a string, and place it in clean water, to remain twenty-four or thirty-six hours; this will give the insect a position which is not easily changed, and it is therefore proper that the position be such as you desire when finished. Remove the string, and open the glasses carefully under water, and float the insect off; give it another brushing, and let it remain a few hours to remove the potassa.

Transfer to a small but suitable vessel containing the strongest alcohol that can be obtained, pursuing the same course as with the water, placing between glass slips, tied together, and letting it remain about twenty-four hours.

Transfer to a vessel containing spirits of turpentine. It is to remain in this, kept between the glasses, until all the water is removed. While in the turpentine, the insect is to be released several times and the moisture removed from the glasses, and the insect again confined.

When no moisture is visible surrounding the insect, heat the glass slips containing the insect over a spirit lamp until the contained turpentine nearly boils, when if any moisture be present, it will show its presence when the glasses are cold.

If free from moisture it is ready for mounting: float it on a suitable slide from the turpentine; drop a sufficient quantity of balsam upon it; examine, and if no foreign substances are present, heat the cover slightly, and apply in the usual way.

After a day or two, heat the slide moderately, and press out the surplus balsam, and place a small weight upon the cover while drying.

After the lapse of a suitable time, remove the surplus and clean the slide.

In all the operations the utmost cleanliness is to be observed; the liquids used to be frequently filtered and kept from dust, and a large share of patience will be found necessary.—THOMAS W. STARR, 324 *Chestnut St., Philadelphia.*

DISTINGUISHING BLOOD CORPUSCLES.—The ordinary method of soaking out the shrivelled and distorted cells from a dried blood stain or clot, and then measuring their diameter under a suitably high power, is conceded to be satisfactory in many of the most frequently occurring cases (for instance, Dr. J. G. Richardson, who has been for several years a prominent advocate of the reliability of this method of distinguishing human blood, under high powers from that of certain domestic animals, has recently shown by numerous experiments the feasibility of thus distinguishing the blood of man, ox and sheep); but it fails when the corpuscles approach each other too nearly in size. It also gives unsatisfactory results with the oval nucleated corpuscles of reptiles, etc., which, when swelled by soaking, do not arrive at their original condition. Dr. R. M. Bertolet of the Philadelphia Hospital is represented as advising the following method of staining these corpuscles, which is applying one of the chemical tests for blood in a new way and with great precision. The blood is moistened with slightly acidulated glycerine, and then carefully irrigated with an alcoholic solution of guiacum resin, and finally a small quantity of ethereal solution of ozonic ether (peroxide of hydrogen) is flowed beneath the cover. By this procedure the whole corpuscle is stained of a uniform color which varies in different corpuscles from a light sapphire to a deep blue, except in case of the nucleated corpuscles in which the nucleus assumes a distinctly different tint from the rest.

EMBEDDING TISSUES.—Mr. R. Packenham Williams, in a paper "On Cutting Sections of the Eye of Insects," read before the Queckett Club, advises that the head, after hardening in alcohol, should be embedded in a mixture of butter of cocoa, bleached beeswax, and a little new Canada balsam. This mixture melts at about 120°, and may be removed from the sections, after cutting, by gently warming them in turpentine. The cutter used in connection with this compound should be wetted with turpentine while making the sections.

SPHÆRAPHIDES. — Professor George Gulliver calls attention in the "Monthly Microscopical Journal," to the hitherto unnoticed sphæraphides in *Leonurus cardiaca*, and also to the two kinds of sphæraphides occurring in this species as well as in *Urtica dioica*, *U. ureus*, *Parietaria diffusa* and *Humulus lupulus:* one kind, the larger and smoother, occurring in the blades of the leaves and consisting chiefly of carbonate of lime; the other kind, smaller and more roughened on the surface, occurring in the fibro-vascular bundles of the leaf and in the pith, and consisting of oxalate of lime except in *L. cardiaca* in which they are composed chiefly of carbonate of lime and in which they are wanting in the pith. Boiling the parts in caustic potash solution discloses these crystals admirably even when not otherwise easily found, as in the case of the leaf of *Ficus carica*.

SPIDERS' WEB.—Mr. H. J. M. Underhill publishes in "Science Gossip" an interesting microscopical study of the spider's web and the mechanism by which it is produced. He finds that of the two to four pairs of spinnerets or web-forming papillæ possessed by spiders, the British species have at least three pairs. The first, or upper pair of spinnerets, produce plain threads of the largest size which are stretched taut from point to point to form the foundation of the web, especially at the edges where great strength is essential; these threads are often doubled or trebled for greater security. The spinnerets of the second pair are somewhat similar but smaller, and produce a smaller but otherwise similar thread. The third pair differs notably in structure, and produces a thread which is either elastic and studded with viscid globules, or is slack, irregular and curled, being in either case adapted for entangling and holding the insect prey. In the common house spider (*Tegenaria domestica*) there are about three hundred and sixty silk-glands each furnished with a separate duct and terminating in a silk tube at the extremity of a spinneret. The first pair of spinnerets has about sixty of these glands, the second pair eighty, and the third pair two hundred and twenty, which are more complicated in structure, though much smaller than the others. In spiders which have four pairs of spinnerets the thread of the fourth pair is somewhat like that of the second, and the aggregate number of silk tubes is greatly increased, being in *Ciniflo atrox* about twenty-six hun-

dred. Thus each pair of spinnerets is calculated to produce a different kind or size of thread; contrary to the common belief that each thread is formed by a coalescence of silk from all, in which case the change from viscid to plain thread would depend in some obscure manner on the will of the animal. Nor do those drops of silk which are simultaneously produced coalesce into a homogeneous thread, as a web under a high power will show many of the threads frayed like a worn rope, and an unfortunate fly is not bound by the coils of a single thread but by a broad band of many detached threads, from the tips of the six spinnerets arranged in a line, thrown rapidly around it.

Coarse Lines on Diatoms.—Mr. F. Kitton, the valued correspondent of "Science-Gossip," again calls attention to the fact that while "smooth" diatoms have been patiently studied with lenses of high resolving power, those with coarse lines or costæ being easy of resolution have escaped such scrutiny, though many of them are possessed of finer markings which are capable of resolution by the means applied to more "difficult" diatoms. The costæ of some species of Synedra and Cymbella he has recently studied in this way, and found the rib-like lines composed of a series of beads, reminding him of peas in a well filled pod. He has not yet been similarly successful with the Pinnularias.

NOTES.

The State Board of Education have presented to the Massachusetts Legislature an extended report relating to the proposed general survey of the state, a subject which was referred to the Board for report by the last legislature. This report makes prominent a number of important points bearing on the necessity of the proposed survey, and gives minute estimates of its cost, which are placed at the comparatively insignificant sum of $25,000 a year for a period of fifteen years. The value of the survey to the people of the state is so very apparent that we have little fear but that the legislature will pass the bill, as soon as it comes before them, notwithstanding the economical wave that in its periodic course has again broken upon our land. Certainly, if we were blessed with a more thorough understanding of our resource, and worked in all departments with more knowledge of the laws of